FOREST PROTECTION
FOREST RESEARCH AND DEVELOPMENT DIVISION
THE CONTROL OF INSECTS ON EUCALYPTS
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INTRODUCTION
Many thousands of insect species use eucalypts as their main source of food and habitat. These insects are also an essential food source for birds and other predators and parasites. In undisturbed conditions, the numbers of eucalypt-feeding insects and their predators and parasites are in balance, so that they rarely cause tree death and most trees quickly recover from attack.

Insects are only one of many factors which can harm young trees and sometimes insect attack is only a sign of other more serious problems. Wind, frost, root damage, weed competition, nutrient imbalance, compacted soil, salinity, drought or waterlogging are all important sources of stress. Trees under stress are more likely to be damaged by insects and it is important to recognise this, and to look for the cause and deal with the sources of stress where possible.

In plantations where large numbers of eucalypts (often only one or two species) are growing, the insects which prefer to feed on them can build up large populations to exploit the food resource. At the same time, conditions may not favour their predators and parasites and they may not be able to control the ‘pest’ before considerable damage has been done.

To minimise insect damage, particularly to young trees, you should manage eucalypt plantations as you would crops, livestock and pasture. Inspect trees regularly for insect damage and disease, and take appropriate action before significant losses occur.

There are several ways of helping to control insects on eucalypts, both directly and indirectly. Although chemicals can provide a quick short-term solution to control damage, the long-term and environmental effects can be detrimental. The best solution lies in a sensible use of various control techniques, often called 'Integrated Pest Management'. The action taken depends on the type of insect attack and the season.

The following information is provided so that the use of chemicals can be minimised as far as possible.

SURVEILLANCE
Regular surveillance and assessment of insect activity within the plantation is essential for effective pest control. The insect causing the damage must be identified and control action must take place at the appropriate time before significant damage occurs.

Figure 1. Young seedling severely defoliated by Christmas beetles.
BIOLOGICAL CONTROL

Native insect pests have a range of natural enemies which usually keep the pest populations low. These enemies include predators (other insects, spiders, birds, frogs, lizards and mammals), parasites (other insects, mites, nematodes) or diseases (fungi, bacteria, viruses).

Most of these animals need other food sources and have habitat requirements such as nesting and breeding sites, which are not found in young plantations. Minimal disturbance of surrounding forest will ensure refuges for predators and may provide alternative hosts for insect pests.

CULTURAL CONTROL

The proposed site for the plantation must be suitable for the species to be planted. Water availability, seasonal rainfall, soil texture, structure and depth, site topography and prior land use must be taken into account. Avoid waterlogged hollows, drouthy soils or excessively exposed sites.

Eucalypt species selection is influenced by local site conditions and the timber characteristics required for projected markets. Selection of appropriate provenances is also important. Trial plantings are identifying eucalypt species and provenances that are more resistant to particular pest insects. This information, if available, should be taken into account when selecting trees.

The timing of site preparation and planting is critical. Drought is the major cause of death of seedlings, so they must be planted when adequate soil moisture is available. Use frost-tolerant species where appropriate. Co-ordinate the finalisation of site preparation with supply of and optimal size and condition of the planting stock. Optimal tree spacing should be considered in terms of desired growth rates, tree form and proposed silvicultural regime.

Healthy, vigorously growing eucalypts can usually outgrow the damage caused by insects, so severe insect attack can be a sign that trees are under stress. Stress may be caused by abnormal climatic conditions resulting in drought or waterlogging, or by soil nutrient deficiencies, competition with other plants, such as weeds, for light, water and nutrients or browsing.

Browsing animals such as wallabies and rabbits can have a major effect on new plantations, particularly during the first year. Rapid growth during the first year will reduce the impact of these animals. Livestock should be excluded from the plantation to reduce soil compaction and damage to young trees.

A high level of weed control is essential for at least the first two years. Competition from grasses and weeds is a major cause of stress and retarded growth during establishment. Some insect pests benefit from a tall dense swathe of grasses and weeds. Fertilisers are also more effective when weeds are controlled at planting. Legumes are presently being trialled to determine their usefulness in nitrogen fixation and controlling grasses, erosion and some pests.

Strict hygiene, such as the prompt removal of dead or dying trees, is strongly encouraged for the life of the plantation.

PHYSICAL CONTROL

This method is so obvious that it is often overlooked as an effective means of control in small plantations, especially when trees are small. In many cases insects can be removed by hand. The egg batches of leaf-eating insects can also be destroyed when noticed. Insect pests such as sawfly larvae, leaf beetle larvae and adults and defoliating caterpillars, such as autumn gum moth and gumleaf skeletoniser, can be controlled this way. Note that the removal by hand of some hairy caterpillars, such as the gumleaf skeletoniser, should be done with caution as the caterpillars have irritating hairs.
CHEMICAL CONTROL

Insecticides have a limited role in forest tree management due to the localised and sporadic nature of most insect damage and the economic and possible environmental costs associated with their use. However, the use of insecticides may be justified as part of a programme of integrated pest management in young plantations to maximise survival and early growth rates.

The use of insecticides should be integrated with a knowledge of the pest insect’s biology to minimise the effect on its predators and parasites and to provide maximum protection with minimum damage to the tree. There is no benefit in spraying almost leafless trees unless protection of young replacement foliage is a viable option. There is also no point in spraying trees if significant damage is unlikely to occur.

- Insecticides must only be used in accordance with the directions on the labels. Seek advice on the cost effectiveness of control measures and recommended control strategies. This can vary greatly, depending on the species of insect, host species and age, time of year and environmental and cost restraints. If you are concerned about insect damage in a plantation, obtain prompt advice from the local Plantation Officers or Foresters associated with the plantation, or from entomologists in the Forest and Timber Protection Section in State Forests' Forest Research and Development Division.

TYPES OF INSECTICIDES

Most insecticides are non-selective and kill a range of insects, including beneficial predators and parasites. They are also toxic to vertebrate predators such as fish, frogs, lizards, birds and mammals, and must never be used near streams, dams and watercourses.

Contact insecticides such as Malathion are fast acting ‘knockdown’ sprays and can provide short term relief against some pests. However they also kill many beneficial insects and predators such as bees, wasps etc.

Systemic insecticides such as Dimethoate are readily absorbed by the tree tissues and are more effective against sap-sucking insects such as psyllids and scale insects, which protect themselves with lerp and scales, or are protected by plant tissues as is the case with leaf miners, gall-forming insects and the later stages of autumn gum moth.

Biological insecticides such as Dipel® contain the spores and endotoxin of the bacterium Bacillus thuringiensis. Their action is confined to the target insects, usually caterpillars, which must eat the spores and toxin. These insecticides are harmless to beneficial insects, man and wildlife. There is currently no insecticide containing Bacillus thuringiensis registered for forestry applications in New South Wales.

Insecticides can be applied with a range of equipment, from hand-operated pressure spray units to tractor-driven motorised misters. At present, only one insecticide is specifically registered in New South Wales for aerial application to control forest insects (see insert).

Chemical control is most useful when insects are actively feeding, but before they have caused significant damage. This means that vigilance is essential. Often by the time that damage is noticeable it is too late to spray.

TIMING FOR INSECTICIDE APPLICATION IS CRITICAL.

See insert for a list of relevant insecticides currently registered for use in New South Wales.

Checklist:

To use insecticides efficiently and minimise risks you must:

1. correctly identify the problem insect to ensure selection of the most suitable insecticide;
2. assess as objectively as possible whether insecticide application will produce a benefit and is warranted;
3. carefully prepare spray equipment to remove residues of chemicals previously used;
4. select the correct insecticide formulation appropriate to the spray equipment available;
5. calibrate equipment to ensure correct application rates;
6. prepare the formulation properly, add a wetting agent if necessary and agitate to ensure thorough mixing;
7. apply the insecticide correctly. Never spray in windy, wet, very hot, frosty or extremely dry conditions. Apply as late as possible in the afternoon or early evening to prevent burning of foliage and to minimise the impact on useful insects and birds;
8. adhere strictly to all directions stated on the label.
Disclaimer

This leaflet is produced for general information only. State Forests relies on published information as to the appropriate use and effectiveness of chemicals referred to and has carried out no research on their effects upon health or otherwise. Users must rely on their own inquiries to appropriate manufacturers or experts as to these matters. State Forests accepts no liability for injury to persons or property, nor loss or damage of whatever kind arising from use of the chemicals referred to.

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INSECTICIDES REGISTERED FOR THE CONTROL OF INSECTS ON EUCALYPTS IN NEW SOUTH WALES AT MAY 1996

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Action</th>
<th>Use</th>
<th>Target insects*</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALATHION</td>
<td>contact</td>
<td>Small trees</td>
<td>scarab beetle larvae, leaf beetles, psyllids, sawflies, moth larvae, mealybugs, leafhoppers</td>
</tr>
<tr>
<td></td>
<td>contact</td>
<td>Eucalypt forests</td>
<td>phasmatid nymphs (aerial application only)</td>
</tr>
<tr>
<td>DIMETHOATE</td>
<td>systemic</td>
<td>Farm and forest trees</td>
<td>scarab beetles, leaf beetles, beetle larvae, psyllids, sawflies, leaf miners, moth caterpillars, bugs, whiteflies, scales, mealybugs, leafhoppers, gall insects, wingless grasshoppers</td>
</tr>
<tr>
<td>METHIDATHION</td>
<td>systemic</td>
<td>Trees in forestry situations</td>
<td>lerp, sawflies, leaf miners, caterpillars, plant bugs, scale insects</td>
</tr>
<tr>
<td>OMETHOATE</td>
<td>systemic</td>
<td>Eucalyptus spp.</td>
<td>whiteflies, mealybugs</td>
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</tbody>
</table>

* as specified on registered label
<table>
<thead>
<tr>
<th>Leaf-eating</th>
<th>Malathion</th>
<th>Dimethoate</th>
<th>Methidathion</th>
</tr>
</thead>
<tbody>
<tr>
<td>scarab beetles (Christmas beetles)</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>scarab beetle larvae</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>leaf beetles</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>beetle larvae (including leaf beetle and weevil)</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>sawflies (including eucalypt sawflies)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>leafminers (including leaf blister sawflies)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>caterpillars (moth larvae) (including autumn gum moth, guillem leaf skeletoniser, cup moths, case moths, white stemmed gum moth)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>wingless grasshoppers</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>phasmatid nymphs (stick insects)</td>
<td>✓</td>
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<table>
<thead>
<tr>
<th>Sap-sucking</th>
<th>Malathion</th>
<th>Dimethoate</th>
<th>Methidathion</th>
<th>Omethoate</th>
</tr>
</thead>
<tbody>
<tr>
<td>psyllids (lerps)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>plant bugs (including rutherfalen bug and <em>Amorphus</em> spp.)</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>whiteflies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>leafhoppers</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>scale insects (including gumtree scale)</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>mealybugs</td>
<td>✓</td>
<td>✓</td>
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<td></td>
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<tr>
<td>gall insects</td>
<td>✓</td>
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